

Though, however, the present book, like its predecessor, is intended primarily for students in colleges and technical schools, and secondly for engineers, and one or more problems, intended to be solved by the reader, are appended at the end of each article, relating to the special subject treated of in the article, it deals with the various hydraulic principles and problems successively investigated in a more simple manner than the former book, which is calculated to commend it to the favourable notice of practical engineers, too engrossed in their work to be able to spare the time for fully grasping abstruse mathematical considerations.

The book is divided into sixteen chapters, and is further subdivided into one hundred and ninety-two articles, each numbered, and dealing with a subject under a special heading connected with the general purpose of the chapter which contains it; whilst an appendix at the end, occupying forty-three pages, after pointing out certain analogies between the flow of water in pipes and the passage of the electric current along wires, and adding some miscellaneous problems for solution, furnishes fifty-five useful hydraulic and mathematical tables, the former being given both in English and in metric measures.

The first four chapters treat successively of "Fundamental Data," "Hydrostatics," "Theoretical Hydraulics," and "Instruments and Observations"; whilst the following six chapters are devoted to the consideration of the various kinds of flow, namely, through orifices, over weirs, through tubes, through pipes, in conduits, and the flow of rivers. The remaining six chapters deal with the important practical subjects of "Water-Supply and Water-Power," "Dynamic Pressure of Water," "Water-Wheels," "Turbines," "Naval Hydromechanics," and "Pumps and Pumping." Nearly two hundred figures in the text, mostly in the form of small, simple diagrams, serve still further to elucidate the hydraulic principles so clearly and concisely enunciated; and these diagrams, instead of being numbered consecutively in the usual manner, are given the same number as the articles which they illustrate, adding *a*, *b*, *c*, &c., where more than one occur in a single article; whilst the same system of numbering is adopted for distinguishing the formulas given in the several articles, and the problems appended at the end of them. The advantage of this peculiar method of numbering is not very clear, though possibly it furnishes an excuse for omitting headings from the diagrams, and for dispensing with a list of them. By the above arrangement, however, each article, with its special number and descriptive heading, constitutes a distinct unit, in which the diagrams and formulas are merged; and whereas the chapters in the text are only headed by their special subject, the headings in the table of contents under the main headings consist merely of an enumeration of the headings of the articles in each chapter, preceded by their distinguishing numbers.

The way in which several independent articles are grouped together in the chapters to which their subjects appertain, is well illustrated by the list of articles contained in the chapter on naval hydromechanics,

comprising "General Principles," "Frictional Resistance," "Work for Propulsion," "The Jet Propeller," "Paddle-Wheels," "The Screw Propeller," "Stability of a Ship," "Action of the Rudder," and "Tides and Waves." The concise and somewhat cursory manner in which the practical subjects considered in the last six chapters are touched upon, is sufficiently indicated by their taking up less than one-third of the whole contents of the book, and by such important and complex questions as water-supply and water-power being together dealt with in a single chapter of twenty-eight pages. This circumstance, however, must not be regarded as at all detracting from the merits of the book; for evidently the author is mainly concerned in laying down the principles of hydraulics, indicating the means and methods of taking observations, and establishing the laws of the flow of water under various conditions, to which subjects considerably the larger portion of the book is devoted. Then, after the principles and laws of hydraulics have been thoroughly elucidated, the methods of their application to various practical purposes, such, for instance, as water-power, water motors, propulsion, and pumping, are successively indicated, without the slightest intention on the part of the author that the brief treatment of these subjects should furnish substitutes for the standard treatises on them.

In the latter part of the book, indeed, the general features of the subjects introduced, and the action of the hydraulic machines are concisely sketched in suggestive descriptions, leaving a full investigation of the various matters touched upon to be sought elsewhere, according to the special branch on which more detailed information is required. Nevertheless, in spite of the brevity of the treatment, interesting particulars are here and there referred to, as, for example, the present utilisation of the Falls of Niagara in the development of 105,000 electrical horse-power, by means of turbines which are described, and the prospect in the near future of a largely increased use of this natural source of power; whilst it is suggested that the tides and waves afford a source of power which at present is wasted, but which, on the exhaustion of the supplies of coal, wood, and oil, may be utilised for generating power, heat, and light in unlimited quantities.

OUR BOOK SHELF.

Synthesen in der Purin- und Zuckergruppe. By Emil Fischer. Pp. 29. (Braunschweig: Friedrich Vieweg und Sohn, 1903.)

THIS lecture, delivered before the Swedish Academy at Stockholm on December 12 of last year, contains an account of Prof. Emil Fischer's work in organic synthesis, and of the motives that have guided him in attacking successively the problems of the uric acid, sugar, and more recently the albuminoid, groups of organic compounds. The synthetical methods by which the constitution of so many naturally occurring substances have been determined are described in outline only, and in a way that will appeal especially to the non-chemical reader. To the chemist the chief charm of the lecture lies in the frankness with which the lecturer describes the purpose and the ultimate goal of the work to which he has devoted himself.

Incidentally the commercial aspects of the purin syntheses are referred to. The sale of caffen and theobromine for medicinal purposes amounts to a million marks annually; at present this is all extracted from tea and cacao, but theophyllin prepared from uric acid is already on the market, and before long it may be possible to manufacture theobromine and caffen at a price that will render it possible to compete with the natural products.

T. M. L.

Report on Field Experiments in Victoria, 1887-1900.
By A. N. Pearson. Pp. 124; with illustrations and tables. (Melbourne, 1901.)

A RECORD of experiments on the manuring of the staple farm crops (chiefly wheat) and of fruit conducted with the cooperation of farmers at many different localities in Victoria during the ten years previous to publication. The discussion is popular in nature, and intended for the farmers of the colony. One point is very noticeable, the comparative inutility of nitrogenous manures on the soils tested and the great returns given by phosphatic dressings. A large number of results are reported, and care has been taken to analyse them and reject those vitiated by some of the many irregular factors to which field experiments are liable. The report sadly needs a digest and an index to make it useful to students of agricultural science.

THE BRITISH ASSOCIATION.

THE attendance at the Southport meeting of the British Association, while passing the numbers at Belfast last year, has fallen short of the Southport meeting of 1883 by about 1000. The weather, no doubt, is accountable for a certain diminution of numbers, for given fine weather in the middle part of last week, it is certain the figures would have reached 2000. As it is, they number 1751. Comparing this figure with those of recent meetings, however, it will be seen that a good average has been maintained, the numbers at Southport this year exceeding those at the meetings at Belfast, Dover, Toronto, Ipswich, Nottingham, and Cardiff, and falling only a little way behind the Leeds meeting of 1890. It is only when the meeting is compared with the former one at Southport that the falling off of numbers is noticeable.

On all hands the local arrangements have met with praise, the suite of rooms in the municipal buildings having proved admirably fitting for the purposes for which they were allotted.

Unfortunately, the climatic conditions during the earlier part of the meeting prevented the local arrangements being carried out to their full extent, the Mayor's reception on Thursday night taking place under most depressing conditions of rain and storm, rendering the outdoor portion of the programme an impossibility. The weather, fortunately, cleared for the excursions on Saturday, but the downpour of the previous days prevented many people from taking tickets, and many of the parties had not their full number.

The experiments in kite-flying had to be abandoned owing to various causes, and Mr. Dines has had to be content to exhibit his apparatus without taking it out to sea.

Prof. Pernter's experiments in the firing of vortex rings took place on Monday afternoon before a large number of spectators, the firing taking place from the roof of the boathouse over the North Marine Park.

The International Meteorological Committee has been sitting in the Town Hall during the meeting of

the British Association, and the members were formally received by the Mayor of Southport in the Mayor's Parlour prior to the beginning of their deliberations. Opportunities have been afforded the many distinguished foreign men of science present in Southport for visiting some of the laboratories, schools, factories, and dockyards of Manchester and Liverpool.

The lecture to working men on Saturday proved very popular, the Cambridge Hall being crowded. A dinner was given by the Mayor at his residence at Greaves Hall to meet Sir Norman Lockyer and Prof. Mascart (President of the International Meteorological Committee). The guests numbered nearly 100, and included Prof. J. Dewar, A. Hopkinson (Vice-Chancellor of Victoria University), Sir George Pilkington, E. Marshall Hall, K.C., M.P., Charles Scarisbrick (Vice-Presidents), Prof. Carey Foster, Major MacMahon, Dr. Adam Paulsen, M. Teisserenc de Bort, Dr. H. Hildebrandsson, Prof. Pernter, General Rykatcheff, Dr. Hellemann, Dr. Hergesell, Dr. H. Mohn, Prof. Willis Moore, A. L. Rotch, Dr. W. N. Shaw, Dr. Ludwig Boltzmann, Dr. T. P. Lotzy, Prof. O. Lignier, Dr. M. Snellen, Dr. G. G. MacCurdy, Dr. H. C. White, T. H. Yoxall, M.P., Hon. T. E. Fuller, Monsignor Molloy, Monsignor Nugent, Canon Denton Thompson, Dr. J. G. Garson, most of the presidents, vice-presidents, and recorders of Sections, and the local secretaries and treasurer.

At the meeting of the general committee held on Friday last, the names of Profs. Mascart, Simon Newcomb, and Boltzmann were added to the list of vice-presidents of Section A.

The Hon. T. E. Fuller, Agent-General for the Cape Colony, Sir Walter Peace, Agent-General for Natal, and Mr. Fiddes, of the Colonial Office (representing the Transvaal), attended on behalf of their respective Governments for the purpose of formally inviting the Association to South Africa in 1905.

On the proposition of Prof. Dewar, seconded by Prof. H. Marshall Ward, it was decided to hold the 1905 meeting in South Africa.

On the motion of Sir Henry Roscoe, seconded by Prof. Forsyth, the Right Hon. A. J. Balfour was elected President of the meeting to be held next year in Cambridge, the meeting to begin on August 17.

The Lord Lieutenant of Cambridgeshire, the Vice-Chancellor of the University, and the Mayor of Cambridge were elected vice-presidents of the Association.

The following elections for the Cambridge meeting were made:—Local secretaries, Messrs. Ginn, A. C. Seward, G. Skinner, and Mr. A. E. L. Whitehead; local treasurers, Mr. A. E. Shipley and Mr. Parker.

Prof. Carey Foster was re-elected treasurer; Major MacMahon and Prof. Herdman general secretaries; and Dr. Garson assistant general secretary.

At the meeting of the committee of recommendations on Tuesday, the following resolutions were adopted:—

(1) That as urged by the President in his address it is desirable that scientific workers and persons interested in science be so organised that they may exert a permanent influence on public opinion in order more effectively to carry out the third object of this Association originally laid down by the founders, viz.:—"to obtain a more general attention to the objects of science and a removal of any disadvantages of a public kind which impede its progress," and that the council be recommended to take steps to promote such organisation.

(2) That the council be requested to consider the desirability of urging upon the Government by a deputation to the First Lord of the Treasury or other-